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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/599,921	10/13/2006	Hiroshi Yoshida	188482/US-465122-00030	6597

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EXAMINER	
JANAKIRAMAN, NITHYA	
ART UNIT	**PAPER NUMBER**
2123	
MAIL DATE	**DELIVERY MODE**
07/21/2010	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/599,921	YOSHIDA ET AL.	
	Examiner	Art Unit	
	NITHYA JANAKIRAMAN	2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 July 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *9-40* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *9-40* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *13 October 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 7/6/2010 has been entered. Claims 9-40 are presented for examination.

Response to Arguments- 35 USC § 101

1. Applicant's amendments with respect to claims 13-16 and 25-32 have been fully considered and are persuasive. The rejections under 35 U.S.C 101 have been withdrawn.

Response to Arguments- 35 USC § 103

2. Applicant's arguments filed 7/6/2010 have been fully considered but they are not persuasive.

Argument 1:

3. Applicant argues on pages 19-20 that Jiang does not cure the deficiency of Chao, namely, a 'fracture limit line' based on a 'shear force and a vertical force'.

4. The Chao reference's entire inventive concept centers on discovering the failure load and fractures of spot welds when subjected to shear and tensile loads. Page 126 states that the study is geared towards developing "an analytical solution for ***predicting*** the ultimate strength of spot weld". Section 8 deals in a combination of both normal (i.e. vertical) and shear forces. Jiang

states on page 1519, "a **linear fracture limit line** could be drawn in an ε_θ-ε_z plane (where ε_θ is the circumferential strain and ε_z is the local axial strain) by linking the fracture points measured on the cylindrical surfaces of specimens, this line being approximately parallel to the line ε_θ-$\varepsilon_z/2$, which represents the strain path for homogeneous compression". Chao is used for teaching shear force and vertical force, not Jiang. Chao already charts the failure rate of a variety of loads (Figures 14, 15, 17). An obvious extension of the Chao reference would be to take the inputs of the normal and shear tests and derive a fracture limit line. Rejection maintained.

Argument 2:

5. Applicant argues on pages 21-22 that it would not be obvious to combine Chao and Jiang.

6. Applicant's primary argument is that Chao's prediction is based upon a series of tests and Jiang's prediction is based upon "numerical analysis". All that is required in the present claims is that a fracture limit line is based upon the inputs of shear force and vertical force, no more. The issue that the fracture limit line comes from a database infinitely expanded in Jiang, is noted but not persuasive. Applicant also makes blanket assertions without support, such that it "would require a very fine mesh division model" and "it is not practical in view of calculating time and costs". Applicant then continues on to point to supposed faults with the accuracy of the Jiang system, which is also not germane to the claims at hand.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

8. Claims 9-32 and 37-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over "Ultimate Strength and Failure Mechanism of Resistance Spot Weld Subjected to Tensile, Shear, or Combined Tensile/Shear Loads" ("Chao") in view of "Large Cold Plastic deformation of metal-matrix composites reinforced by SiC particles" ("Jiang").

9. Chao discloses a fracture prediction device for use with a spot welded portion. However, Chao does not disclose a fracture limit line.

10. Jiang does disclose this (see page 1519).

11. Chao and Jiang are analogous art as they are both related to the field of stress fractures in materials.

12. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to combine the fracture limit line of Jiang with the fracture prediction device of Chao, motivated by the desire to "to study the workability of ductile materials by examining the free-surface strain histories until fracture occurred" (see Jiang, page 1519).

13. Regarding claim 10, Chao and Jiang teach:

A fracture prediction device provided for a spot welded portion *(Chao: Introduction, "predict the failure strength of a spot weld)*, comprising:

an input arrangement configured to input **at least one of** a material strength, a plate thickness, a nugget diameter of a spot welding, a plate width of a particular joint, or a rotation angle *(Chao: Table 1, "Thickness of the sheet", "Nominal Nugget Diameter")* of the joint plates in a tension testing procedure which is at least one of a cross tension testing procedure or a shear tension testing procedure at a spot welded joint *(Chao: Abstract, "lap-shear and cross tension test samples")*;

a first calculation arrangement configured to determine a fracture strength parameter in **at least one** of a cross tension or a shear tension based *(Chao: Abstract, "lap-shear and cross tension test samples")* on a fracture strength curve of the spot welded portion *(Chao: Introduction, "curve fitted to a force based criterion for design consideration"; Figure 1)* obtained from **at least one** of the material strength, the plate thickness, the nugget diameter of the spot welding, the plate width of the joint, or the rotation angle of the particular joint in the tension testing procedure *(Chao: Table 1, "Thickness of the sheet", "Nominal Nugget Diameter")*;

a parameter storage arrangement configured to store the fracture strength parameter by each steel type *(Chao: Section 7, "from plain carbon steel to HSLA and the test sample geometries include cross tension, lap-shear, coach peel as well as in-plane torsion")*; and

a second calculation arrangement configured to analyze a fracture of the spot welded portion by providing the fracture strength parameter stored in the parameter storage arrangement *(Chao: Abstract, "Data from strength tests as well as finite element numerical method are used to validate the model. Finally, the utility of the model in accessing the failure strength of spot welds is discussed")* into a fracture limit line *(Jiang: page 1519, "a linear fracture limit line could be drawn in an ε_θ-ε_z plane (where ε_θ is the circumferential strain and ε_z is the local axial strain) by linking the fracture points measured on the cylindrical surfaces of specimens, this line being approximately parallel to the line ε_θ-ε_z/2, which represents the strain path for homogeneous compression")* in which a deformation at a periphery of the spot welding portion is modeled by a finite element procedure *(Chao: Table 2, "finite element analysis")*.

wherein the fracture limit line *(Jiang: page 1519, "a linear fracture limit line could be drawn in an ε_θ-ε_z plane (where ε_θ is the circumferential strain and ε_z is the local axial strain) by linking the fracture points measured on the cylindrical surfaces of specimens, this line being approximately parallel to the line ε_θ-ε_z/2, which represents the strain path for homogeneous compression")* is based on a shear force and a vertical force with respect to the spot welded portion *(Chao: page 131, "Mixed Normal/Shear Loading", "Having the stress distributions developed for spot weld subjected to normal force, i.e., cross tension sample, and shear force, i.e., lap-shear sample, an extension to mixed normal/shear loading conditions is investigated in*

this section. The analytical result is then compared with test data. For spot weld loaded with a combination of normal and shear forces").

14. Regarding claim 19, Chao and Jiang teach:

The fracture prediction device of claim 10, wherein the shear force is provided in a direction along a member surface of an element that connects members with each other in which the spot welding is modeled, and the vertical force is provided in a direction that connects members with each other orthogonally to the shear force *(Chao: page 131, "Mixed Normal/Shear Loading", "Having the stress distributions developed for spot weld subjected to normal force, i.e., cross tension sample, and shear force, i.e., lap-shear sample, an extension to mixed normal/shear loading conditions is investigated in this section. The analytical result is then compared with test data. For spot weld loaded with a combination of normal and shear forces").*

15. Regarding claim 20, Chao and Jiang teach:

The fracture prediction device of claim 10, wherein the shear force is determined one after another during a deformation of a collision analysis reproduced using the finite element procedure *(Chao: Abstract, "finite element numerical method are used to validate the model", page 130, "detailed finite element analyses for spot weld subjected to mixed far field normal/shear load").*

16. Regarding claim 37, Chao and Jiang teach:

The fracture prediction device of claim 10, wherein the fracture strength curve provides a graphic representation written by measuring the fracture strength parameter by a test in which at least one of the material strength, the plate thickness, the nugget diameter of the spot welding, the plate width of the joint, or the rotation angle of the particular joint in the tension testing procedure are varied *(Chao: Table 1, "Thickness of the sheet", "Nominal Nugget Diameter")*.

17. Claims 9, 11-18, 21-32, and 38-40 are rejected for almost identical reasoning as above.

18. Claims 33-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chao, in view of Jiang, further in view of "The Role of the Interfacial strength in glass bead filled HDPE" ("Bai").

19. Chao in view of Jiang teaches a fracture prediction device for use with a spot welded portion. However, Chao in view of Jiang does not teach a stress concentration factor. Bai does teach this.

20. Chao, Jiang, and Bai are all analogous art as they are all related to the field of materials strength.

21. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to combine the stress concentration factor of Bai with the fracture prediction device of Chao in view of Jiang, motivated by the desire to quantify the strength of various materials, which is obviously desirable to one of ordinary skill.

22. Regarding claim 33, Chao, Jiang, and Bai:

The fracture prediction device of claim 9, wherein the fracture strength parameter is determined based on a stress concentration factor a defined by (tensile strength TS) / (mean tensile stress σo) *(Bai: page 1588, "Here, σ_{cr} is the macroscopic average tensile stress at the moment of the interfacial debonding...The relation between σ_{cr} and σ_i can be expressed as: $\sigma_i = \eta\sigma_{cr}$, where η is the stress concentration factor in the polar region of the interface and depends on the size, distribution and volume fraction of particles"; solving the equation for η provides the claimed formula).*

23. Claims 34-36 are rejected for almost identical reasoning as above.

- While only certain citations have been given, Applicant should consider the reference in it entirety.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to NITHYA JANAKIRAMAN whose telephone number is (571)270-1003. The examiner can normally be reached on Monday-Thursday, 8:00am-5:00pm, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Rodriguez can be reached on (571)272-3753. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Nithya Janakiraman/
Examiner, Art Unit 2123

/Jason Proctor/
Primary Examiner, Art Unit 2123